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Patentanmeldung Nr. Patent application No. Demande de brevet n°

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Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:
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Disk drive unit having a loading mechanism

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Disk drive unit having a loading mechanism

28.10.2002



The present invention relates to a disk drive unit having a disk loading mechanism, and in particular to a disk drive unit comprising:

a housing having an opening in a wall thereof for inserting or removing a disk into or from the housing,

5 a disk drive accommodated in the housing and adapted to engage and rotate a disk in order to allow a head to read data from or write data on a disk,

a loading mechanism for receiving a disk through the opening in the housing and bringing it in engagement with the disk drive, and vice versa, said loading mechanism comprising:

10 a slide which is slidable with respect to the housing and the disk drive between a first position for receiving a disk and a second position covering the opening and allowing the disk drive to engage the disk.

15 Disk drive units having a disk loading mechanism are widely spread, particularly in audio, video and computer devices. Most of these devices are stationary devices. The disk loading mechanisms of these stationary devices include a slide in the form of a drawer having a first position projecting from the housing so as to enable a disk to be placed on the drawer, and a second position in which the drawer has been retracted to close
20 the opening and to allow the disk drive to rotate the disk. An example of such disk loading mechanism is disclosed in DE-A-34 43 070.

As the disk loading mechanisms as described are relatively fragile, these mechanisms are not very well suited for mobile applications, particularly in miniature devices. Then a drawer of such small device would be even more delicate, while there is also
25 more risk of damage due to the transport and handling of such mobile devices, such as telephones and the like.

It is an object of the present invention to provide a new disk drive unit having a disk loading mechanism.

To obtain this object, the invention provides a disk drive unit in which the loading mechanism comprises a slide which is slidable substantially alongside the wall of the housing in which the opening is made and which is adapted to receive the disk through the opening in the housing.

Due to the features of the invention, the slide will not project perpendicularly away from the housing in its first, opening position, thereby reducing the risk of damage to the slide. This makes the disk drive unit more suitable for use in mobile and/or hand-held devices.

It is favourable if the slide includes a tray to receive the disk in it, said tray having a bottom and circumferential walls sealing against the adjacent wall of the housing.

This sealing of the tray of the slide will limit the entrance of dust or other dirt into the housing, which could affect the operation of the read/write head of the disk drive, in particular if it concerns a small form factor optical disk drive.

In one embodiment, the slide and the disk drive are operatively coupled to obtain a relative movement during the sliding movement of the slide, so as to bring a shaft of the disk drive into and out of engagement with the disk. In a simple embodiment, the slide and the disk drive are mechanically coupled through an operating mechanism. In one embodiment thereof, the operating mechanism comprises at least a groove on one of said slide and disk drive, and extending slightly offset to a direction substantially parallel to the sliding direction of the slide, and further an engagement member on the other of said slide and disk drive and adapted to come into engagement with the groove to effect said relative movement.

In this way there is obtained a very simple mechanical operation of the disk drive. This mechanical engagement release to a translational or pivotal movement of the disk drive.

In a simple embodiment it is further possible that the slide is manually slidable, wherein the slide is, for example, guided on guides on the outside of the housing, the guides being preferably arranged on walls of the housing adjacent the wall including the opening and extending parallel to the direction of movement of the slide. In this way the slide is easy to operate by hand and this structure may also lead to a small building height of the loading mechanism.

In a particular embodiment, the slide comprises a cover dimensioned to cover the opening in the housing wall when the slide is in the second position, and which slides along the wall of the housing containing the opening, preferably on the outside thereof, the cover and tray may then be positioned substantially adjacent to each other. In this
5 embodiment, it is advantageous if the cover is provided with operating means of the disk drive unit, such as a display, keys and the like, and wherein there is an electrical connection between the cover and the housing. As a result, no area of the housing wall is lost for placement of operating means due to the cover or the opening. A further reduction of space loss is obtained if the cover is adapted to slide over operating means of the disk drive unit,
10 such as a display, keys or the like, when in its second position.

Further details and advantages of the invention will be explained in the following description of the figures in the drawing schematically showing an embodiment of
15 the invention by way of example.

Figs. 1, 2, 3 are very schematic longitudinal sectional views of a device including an embodiment of the disk drive unit according to the invention, in three different positions.

Fig. 4 is a perspective view from above showing the slide from the device of
20 Figs. 1-3.

The drawings, and particular Figs. 1-3 thereof, show an electronic mobile device, such as a mobile phone, a PDA or the like, incorporating the embodiment of the disk
25 drive unit according to the invention. The device/disk drive unit comprises a housing 1 including a.o. an upper wall 2, side walls 3 and a lower wall 4.

In this case in the upper wall 2, there is provided an opening 5 for inserting a disk A into the housing in order to use it in the disk drive unit.

In the embodiment shown, the disk A is preferably an optical disk which is
30 contained in a cartridge B to protect the disk against dust, scratches or the other environmental influences which may affect the operation of the disk A. However, the invention is also suitable for co-operation with a disk, optical or non-optical, without cartridge.

A loading mechanism of the disk drive unit comprises a slide 6, in this case including a tray 7 and a cover 8. The tray 7 is adapted to receive a disk A or the disk cartridge B therein through the opening 5 in the upper housing wall 2. The slide 6 is slidable with respect to the upper wall 2 of the housing 1 between a first position in which the tray 7 is substantially aligned with the opening 5 in the housing wall 2 so as to insert or remove a disk cartridge B and a second position in which the tray 7 and the disk A contained therein are aligned with a disk drive 9 and in particularly a drive shaft 10 thereof. In this second position the cover 8 covers the opening 5 in the housing wall 2.

The tray 7 of the slide 6 comprises a bottom 11 and four upright walls 12. The upright walls 12 are dimensioned such that they seal with their upper edges against the inner side of the housing wall 2 so as to prevent dust from entering the housing 1, or at least limit this to a sufficient extent. The bottom 11 of the tray 7 includes an access opening 14 to allow co-operation of the disk drive 9 and the disk A, in particular to allow engagement between a drive shaft 10 and a hole in the disk A and to allow a read/write head (not shown) of the disk drive 9 to co-operate with the intended surface area of disk A. For this purpose the cartridge B also includes a (closable) access opening or the like. The disk drive unit may be provided with means to open or close any closure of the access opening 14 in the bottom 11 of the tray 7 and any access opening in the disk cartridge B. As usual, means may be provided for positioning the cartridge in the disk drive and for detecting a correctly positioned cartridge. Furthermore, the disk drive unit may comprise means for locking the slide 6 in the second position as long as the motor of the disk drive is rotating.

To allow engagement and disengagement of the drive shaft 10 of the disk drive 9 with the hub or hole in the disk A, the disk drive 9 is movable relative to the slide 6, particularly in a direction substantially perpendicularly to the direction of movement of the slide 6. The movement of the disk drive 9 may be a translational, pivotal or combined movement. In the embodiment shown, the disk drive 9 is pivotable around a pivot axis 14 provided on the side of the disk drive 9 closest to the opening 5 in the housing wall 2. In a simple embodiment, the disk drive 9 and/or the tray 7 is provided with at least a guide groove (not shown) extending mainly in a direction substantially parallel to the sliding direction of the slide 6, but slightly offset therefrom. The other of said tray 7 and disk drive 9 includes an engagement member which may be a pin or other projection allowed to engage in the mentioned guide groove.

If the direction of the guide groove had a slight angle to the direction of movement of the slide 6, when the slide 6 is in its first, loading position (Fig. 1), engagement

of the engagement member and the guide groove will cause a pivoting movement of the disk drive 9 around the pivot axis 14 during the sliding movement of the slide 6 to the second, loaded position (Fig. 2). These movements are illustrated by arrows in Fig. 2. Of course, other mechanical coupling means are conceivable, whereas in more expensive devices, the disk drive 9 may also be moved electrically. As an alternative, the slide may perform a combined movement to allow the disk to come into and out of engagement with the drive shaft of the disk drive.

Fig. 4 shows that the cover 8 is provided with guide flanges 15 at its sides extending parallel to the direction of movement of the slide 6. The guide flanges 15 may include a lower ridge 16 for engagement in a guide groove 17 in the side walls 3 of the housing 1. In this manner, the cover 8 of the slide 6 is properly guided in a simple manner in order to allow and guide a manually driven sliding movement of the slide 6. Additionally or alternatively, the tray 7 may also include guide means to co-operate with the upper wall 2 or side walls 3 of the housing 1. The flanges 15 are also used to grip the slide 6 in order to move it by hand.

The upper surface 18 of the cover 8 may be used to accommodate operating means of the device, such as keys, a display or other means. If these operating means would require an electrical or electronic connection with the housing 1, there may be provided an electrical or electronic connection between the slide 6 and the housing 1, for example through a flex wire, wireless or the like. Furthermore, the cover 8 may be constructed such that, in the first position of the slide 6, it is slid over operating means of the device, such as keys, a display or other operating means. In this way efficient use is made of the surface area of the upper housing wall 2 and the cover 8.

From the foregoing it will be clear that the invention provides a disk drive unit and device having a simple, reliable, robust and compact loading mechanism, which is sealed effectively.

The invention is not restricted to the above-described embodiment as shown in the drawing, which can be varied in several ways without departing from the scope of the invention. The disk may be readable/writable by other means such as magnetically. The slide may be guided in another way, and may also be arranged substantially within the housing. Thus, the disk drive unit may also be adapted to co-operate with a disk without a cartridge.

CLAIMS:

28.10.2002



1. A disk drive unit having a disk loading mechanism, comprising:
a housing having an opening in a wall thereof for inserting or removing a disk into or from the housing,
a disk drive accommodated in the housing and adapted to engage and rotate a
5 disk in order to allow a head to read data from or write data on a disk,
a loading mechanism for receiving a disk through the opening in the housing and bringing it in engagement with the disk drive, and vice versa, said loading mechanism comprising:
a slide which is slidable with respect to the housing and the disk drive between
10 a first position for receiving a disk and a second position covering the opening and allowing the disk drive to engage the disk,
wherein the slide is slidable substantially alongside the wall of the housing in which the opening is made and is adapted to receive the disk through the opening in the housing.
15
2. The disk drive unit of claim 1, wherein the slide includes a tray to receive the disk in it, said tray having a bottom and a circumferential wall sealing against the adjacent wall of the housing.
- 20 3. The disk drive unit of claim 2, wherein the bottom of the tray is provided with a (closable) opening to gain access to the disk.
4. The disk drive unit of claim 2 or 3, wherein the tray of the slide is slidably guided within the housing, along the inner side of said housing wall including the opening.
- 25 5. The disk drive unit of one of the preceding claims, wherein the slide and the disk drive are operatively coupled to obtain a relative movement during the sliding movement of the slide, so as to bring a shaft of the disk drive into and out of engagement with the disk.

6. The disk drive unit of claim 5, wherein the slide and the disk drive are mechanically coupled through an operating mechanism.

5 7. The disk drive unit of claim 6, wherein the operating mechanism comprises at least a groove on one of said slide and disk drive, and extending mainly in a direction substantially parallel to the sliding direction of the slide, and further an engagement member on the other of said slide and disk drive and adapted to come into engagement with the groove to effect said relative movement.

10 8. The disk drive unit of claim 6 or 7, wherein disk drive is pivotable about an axis on a side of the disk drive closest to the opening and extending substantially perpendicularly to the direction of movement of the slide and substantially parallel to the disk drive.

15 9. The disk drive unit of claim 8, wherein the slide is manually slidable.

10. The disk drive unit of claim 9, wherein the slide is guided on guides on the outside of the housing, the guides being preferably arranged on walls of the housing adjacent the wall including the opening and extending parallel to the direction of movement of the slide.

20 11. The disk drive unit of one of the preceding claims, wherein the slide comprises a cover dimensioned to cover the opening in the housing wall when the slide is in the second position, and which slides along the wall of the housing containing the opening, preferably on the outside thereof.

25 12. The disk drive unit of claims 4 and 11, wherein the cover and tray are positioned substantially adjacent to each other.

30 13. The disk drive unit of claim 11 or 12, wherein the cover is provided with operation means of the disk drive unit, such as a display, keys and the like, and wherein there is an electrical connection between the cover and the housing.

14. The disk drive unit of claim 11, 12 or 13, wherein the cover is adapted to cover operating means of the disk drive unit, such as a display, keys or the like, when in its second position.

5 15. The disk drive unit of one of the preceding claims, integrated in a portable, hand-held device, such as a mobile telephone.

16. The disk drive unit according to one of the preceding claims, intended to be used with a disk contained in an openable cartridge, the unit comprising means for
10 positioning and/or opening the cartridge.

ABSTRACT:

28.10.2002

A disk drive unit having a disk loading mechanism, comprising a housing (1) having an opening (5) in a wall thereof for inserting or removing a disk. A disk drive (9) is accommodated in the housing. A loading mechanism for receiving a disk through the opening in the housing and bringing it in engagement with the disk drive comprises a slide (6). This is slidable with respect to the housing and the disk drive between a first position for receiving a disk and a second position covering the opening and allowing the disk drive to engage the disk. The slide is slidable substantially alongside the wall of the housing in which the opening is made and is adapted to receive the disk through the opening in the housing. This leads to a robust and compact structure of the disk drive unit.

10

Fig. 1



1/2

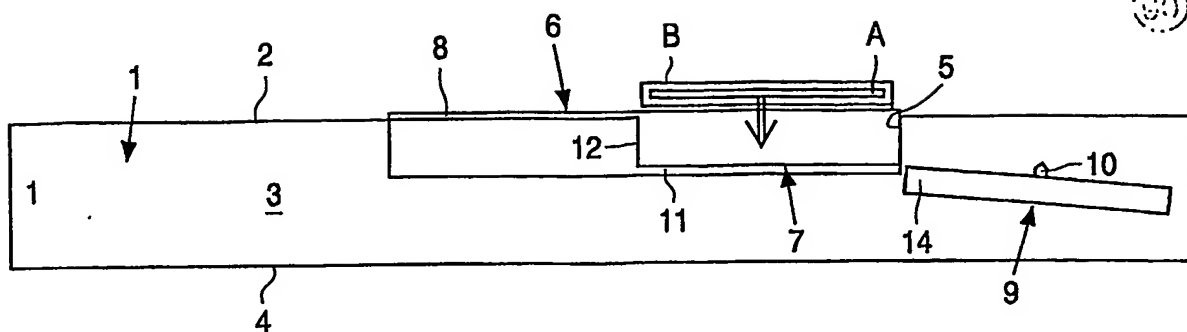


FIG. 1

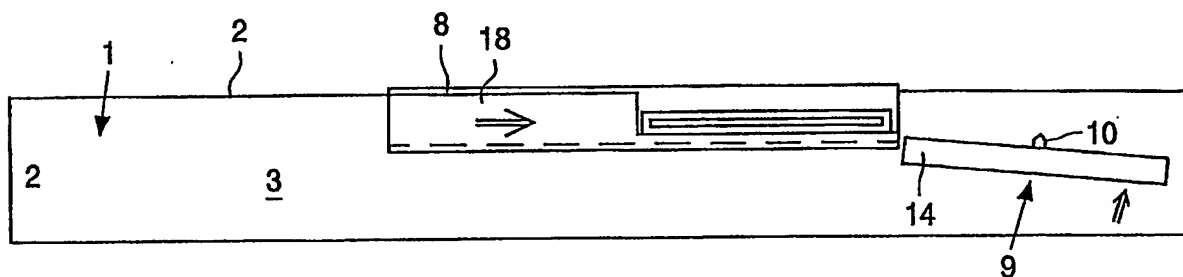


FIG. 2

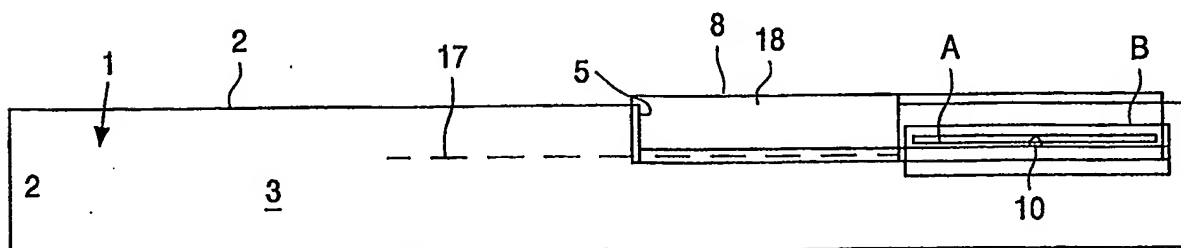


FIG. 3

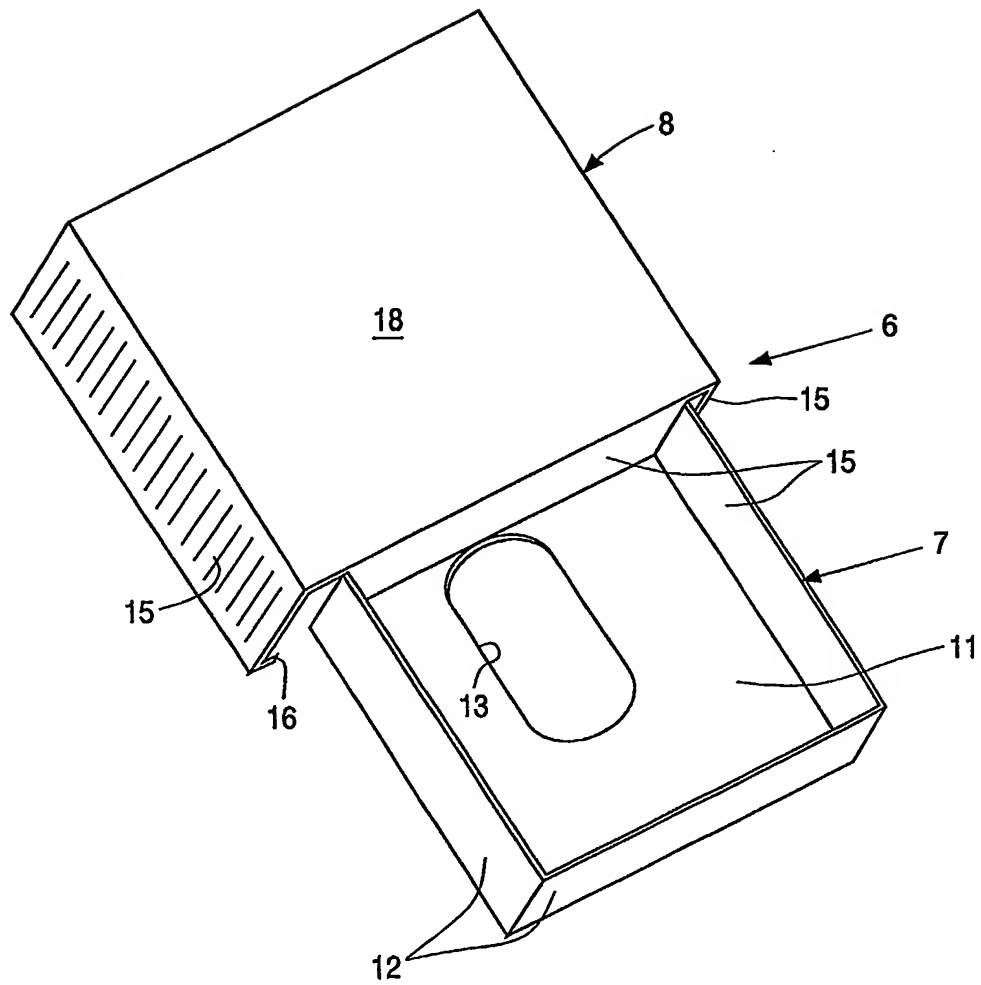


FIG. 4

INTERNATIONAL SEARCH REPORT

Rec'd PCT TO 27 APR 2005

PCT/IB 03/04288

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 611B17/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 611B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 100 34 420 A (LOEWE OPTA GMBH) 24 January 2002 (2002-01-24) column 2, line 40 - line 59; figures 1-3	1-16
Y	US 4 653 037 A (KAWANAKA YOSHIKAZU ET AL) 24 March 1987 (1987-03-24) column 4, line 1 - line 16; figure 1	1-16
A	US 4 479 210 A (NAKAYAMA MITUHISA) 23 October 1984 (1984-10-23) column 3, line 31 - column 4, line 20; figures 1,2,5,6	5-8

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

2 December 2003

Date of mailing of the international search report

12/12/2003

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INTERNATIONAL SEARCH REPORT

PCT/IB 03/04288

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